Carbon Monoxide Risk Management

Carbon Monoxide

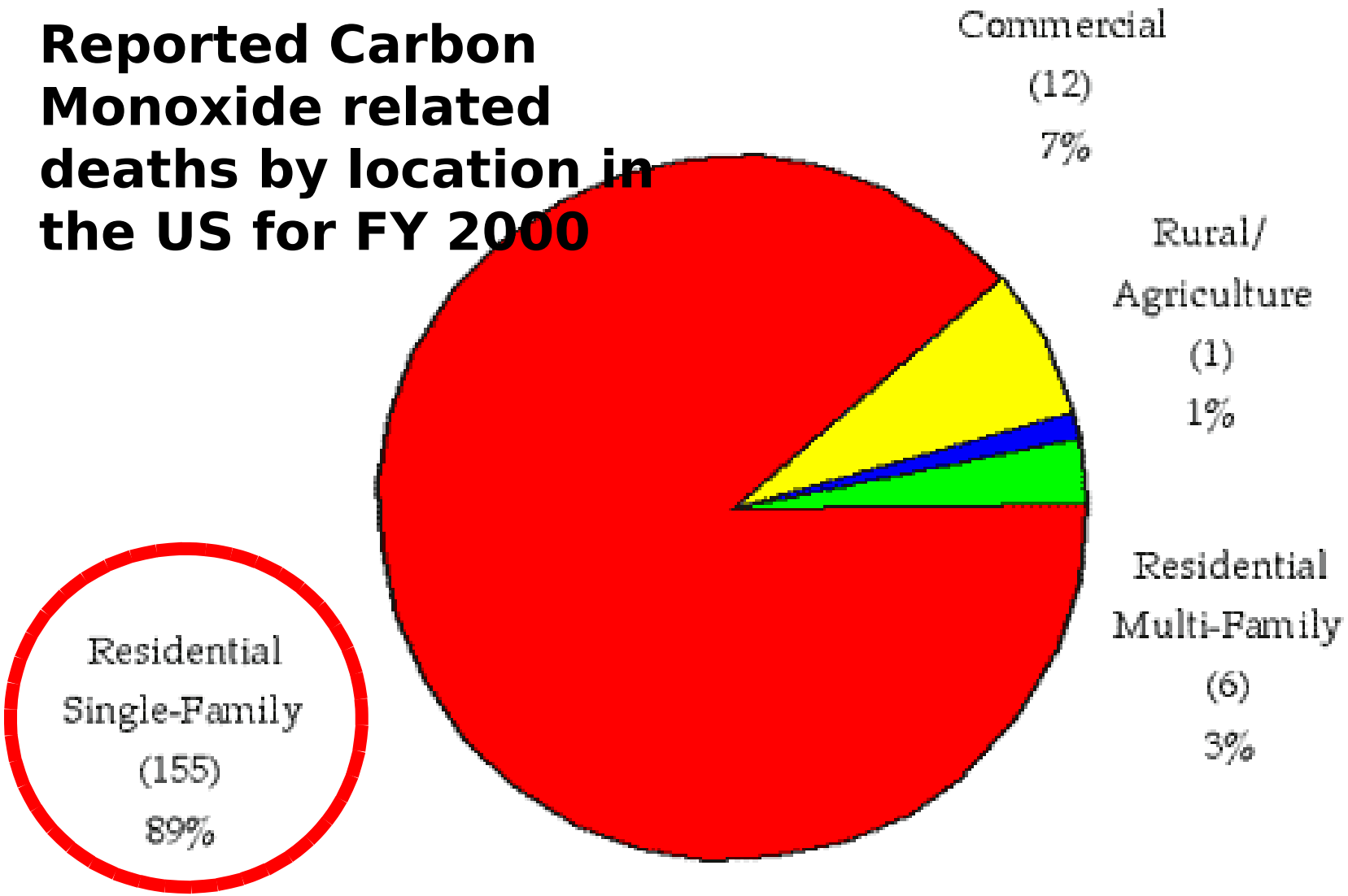
With the onset of cold weather, most of us have already switched on our heating systems. Beware! If you have not maintained your heating equipment this single act can be fatal.

According to the Consumer Product Safety Commission (CPSC), CO poisoning associated with fuel-burning appliances kills more than 200 people each year.

Service members are not immune. One Sailor and his four dependents and one Marine died as a result of CO poisoning. The Petty Officer and his family died after turning on their gas furnace the first night temperatures dropped. The marine's death resulted from sitting in a car with the

Carbon Monoxide

Reported Carbon Monoxide related deaths by location in the US for FY 2000



OUTLINE

1. Test Your Risk - Take the Test
2. The Physiology of CO
3. Carbon Monoxide Risk Management
4. Symptoms of Carbon Monoxide Poisoning
5. Treatment
6. Prevention
7. References

Carbon Monoxide

Test Your Risk - Take the Test

True or False

Question: Carbon monoxide is a poisonous gas which is dangerous at high levels. It's created when fuels like wood, oil and gas burn. Normally, the small amounts caused by our heating equipment are vented to the outside and do not build up inside.

True False

Question: Carbon monoxide builds when the air circulating through our homes and heating systems doesn't get vented properly.Venting problems such as birds building nests in chimneys can happen in homes of any age.

True False

Question: Carbon monoxide is odorless, colorless and tasteless which is why it's often called the "silent killer".

True False

Carbon Monoxide

Question: Heating systems (furnaces, fireplaces, wood burning stoves, and chimneys) should be checked every year before the heating season by a certified heating technician.

True False

Question: If anyone feels ill - get everyone, including your pets, out of the house regardless if the alarm is sounding or not. Call 911 or your local fire department for help. Once the source of the CO is found - stay out of your home until repairs are complete. If no one is ill, ventilate the building by opening all windows and doors. Reset the alarm. If it continues to sound, call a certified heating technician to check for carbon monoxide

True False

Question: There is always the risk that carbon monoxide will leak into the house even if the garage door is open.

True False

Carbon Monoxide

Question: Many victims of carbon monoxide poisoning recover with treatment. However, in very severe cases, CO poisoning can cause permanent brain damage.

True False

Question: Carbon monoxide poisoning has symptoms that are similar to the flu: nausea, headache, burning eyes, confusion, drowsiness, and loss of consciousness. The key difference is that there is no fever with CO poisoning. The symptoms tend to disappear when the person gets fresh air. These are all warning signs.

True False

Question: The first line of defense against carbon monoxide poisoning is prevention through annual inspections of your home heating equipment including vents and chimneys. Alarms are a good second line of defense and every home should have them.

True False

Carbon Monoxide

THE ANSWERS:

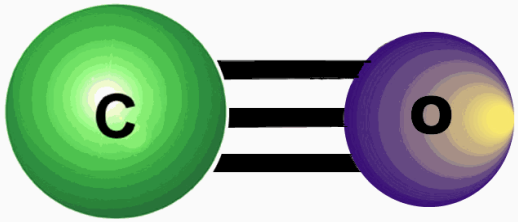
Are you at risk from carbon monoxide Poisoning?

You are if,

you thought any of the statements were false!

They were all true.

The Physiology of CO

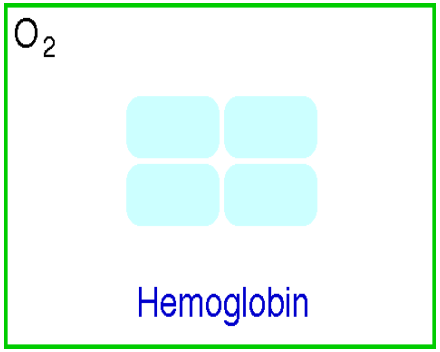


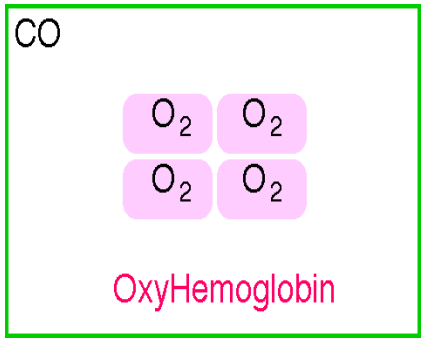
Model of a Carbon Monoxide Molecule.

Carbon Monoxide (known by the chemical symbol CO) is a colorless and practically odorless gas. It is poisonous to people and animals, because it displaces oxygen in the blood. It is produced by the incomplete burning of solid, liquid, and gaseous fuels. Appliances fueled with natural gas, liquefied petroleum (LP gas), oil, kerosene, coal, or wood may produce CO. Burning charcoal produces CO. Running cars produce CO.

The Physiology of CO

Normal oxygenation of the tetrameric (ie. 4 subunits) hemoglobin molecule. As it goes from (deoxy)hemoglobin to oxyhemoglobin the color changes from blue, as in venous blood, then ~~to pink, as in arterial blood.~~

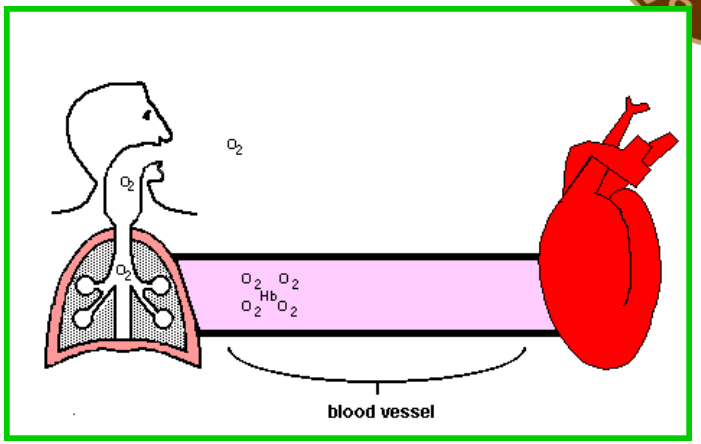


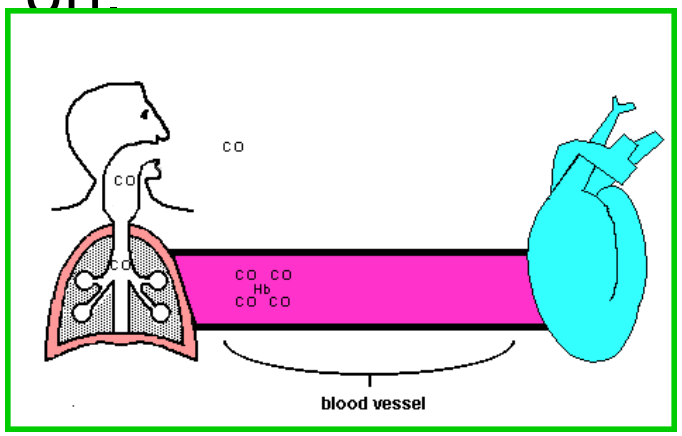


Here carbon monoxide (CO) enters the picture, and through its very high affinity for hemoglobin, displaces the oxygen from the hemoglobin. This prevents oxygen being carried to the tissues and organs of the body. Carboxyhemoglobin is reddish in color.

The Physiology of CO

Oxygen is carried from the lungs by the blood hemoglobin to the tissues, here the beating heart is shown, and normal healthy oxidative metabolism goes on.





During Carbon Monoxide poisoning, CO is carried from the lungs by the blood hemoglobin to the tissues, preventing oxygen from being carried, and blocking normal oxidative metabolism. Note how slowly and weakly the heart is beating, since it is starved for oxygen (ie. blue in color).

Carbon Monoxide Risk Management

CO is so dangerous you can not take anything for granted. The old maxim "if something can go wrong, it will" applies equally to home heating appliances. Be proactive. Use the risk management process to prevent poisoning. Here's how:

1. **Identify hazards** - inspect your heating system for such things as a faulty furnace/heater, closed fresh make-up air return, dirty/clogged filters, blocked return air registers, inadequate ventilation, blocked chimney flue, or inoperative CO alarm. Certain plastic furnace vent pipes have just been identified in a recall by CPSC and require replacement.

Carbon Monoxide Risk Management

2. **Assess risks** - critical - CO likely to cause death as exposure time and concentration increases. The potential for serious harm is so great immediate action is required if any hazards are found.

3. **Make risk decisions** – develop controls - Have a qualified technician inspect your heating system, space heaters, fireplaces, hot water heater, vents and piping.

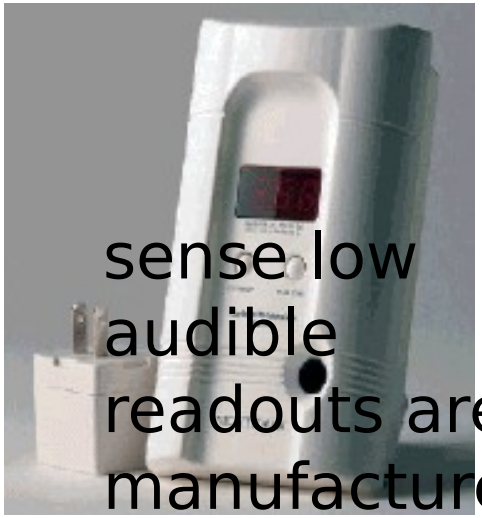
4. **Implement controls** -
Clean or replace dirty filters regularly. Heed the manufacturer's recommendations. Do not allow furniture to block air registers.

Carbon Monoxide Risk Management

4. Continued (**Implement controls**) -

- If you use supplemental heaters, follow the manufacturer's warning about ventilation. (If you live in base housing ensure their use is allowed.)
- Never use a hibachi or barbecue grill inside a home or garage.
- Ensure the flue is unobstructed before lighting your fireplace.
- Never leave your vehicle running in the garage. Do not assume opening the garage door is sufficient protection. When you start the engine, drive the vehicle outside immediately. When you return, turn off the motor as soon as you stop. If you suspect there is an exhaust leak, have it repaired.

Carbon Monoxide Risk Management



Purchase and install one or more CO alarms. Units are designed to sense low levels of co and sound a loud audible alarm. Units with digital readouts are best. Follow manufacturer's recommendations for testing the alarm. Every month and if powered by a battery, replace as recommended.

5. **Supervise** - Be sensitive to health changes (unexplained headaches, nausea, dizziness, fatigue). If you suspect you or someone in your house is experiencing co exposure or poisoning, get fresh air immediately. Open doors and windows. Call your emergency telephone number and go to an emergency room. Don't wait.

Common Producers of CO

All of these items “Burn” some type of fuel

Symptom of Carbon Monoxide

The first **symptom*** of carbon monoxide poisoning is usually a ***tightness across the forehead*****,** followed by ***headache*** and **pounding of the heart**.

A positive **sign*** of progressive carbon monoxide poisoning is if the victim's **face becomes extremely red**. Weariness, dizziness, and mental changes may also occur.

However, if the carbon monoxide is very concentrated, the victim may pass out without feeling any of these symptom.

* A symptom is something YOU feel, a sign is something you SE

TREATMENT

The following is recommended for victims of carbon monoxide poisoning:

- Remove victim away from contaminated area into fresh air and loosen clothing.
- Give artificial respiration or CPR, as appropriate.
- If oxygen is available, give it to the victim by using a face mask.
- Seek medical attention immediately.
- Keep victim resting.

TREATMENT

If the victim was severely exposed to carbon monoxide, symptoms may occur days, or even weeks later, even if the victim at first appears to have fully recovered.

Delayed symptoms include visual defects (blurry vision, or loss of sight), dizzine profound changes in emotion and will power, as well as mental changes (depression).

PREVENTION

You can safeguard against carbon monoxide poisoning by making sure of the following:

✓Never sit in vehicles for long periods with the engine running and windows closed.

✓Never sleep in or near vehicles with the engine running.

✓Never operate engines in a closed garage without exhaust ventilation.

•

PREVENTION

- ✓Check to be sure there are no leaks in your vehicle exhaust system.
- ✓Avoid the use of **unvented heaters** and charcoal grills in closed areas. (AE Pam 385-15)
- ✓Avoid lodging in a room or house heated by charcoal.
- ✓If in doubt as to the heating system, open a window for ventilation.
- ✓Avoid sleeping directly on the floor.
- ✓Make sure heaters are set at the proper combustion ratio and heating system is leak free.

PREVENTION

If you become stranded, you should remain in your v
Periodically run the heate
warm.

However, when doing this, open the windows slightly ensure the vehicle exhaust not blocked (i.e., with

Only run the engine it is necessary to

as long as keep warm.

Carbon Monoxide

Installation commanders and residents working together can prevent carbon monoxide poisoning from happening in living quarters.

BSB Commanders, through DPW, should provide qualified preventive maintenance personnel to routinely inspect quarters for serious health hazards. An inspection is especially critical when quarters have been vacated and are awaiting new families.

Commanders can also provide programs that will teach residents to identify and correct minor problems and report more serious problems, including potential safety hazards, to BSB/ASG Safety.

REFERENCES

This information was based on:

- AE Pam 385-15, Leader's Operational Accident-Prevention Guide
- "Carbon Monoxide Questions and Answers" developed by the U.S. Consumer Product Safety Commission, Bethesda, Maryland. CPSC Document #466.
- "Sources of Indoor Air Pollution - Carbon Monoxide (CO)" developed by the U.S. Environmental Protection Agency, Washington, DC.

For More Information

Contact your Unit Safety Officer

Or

Your local BSB/ASG Safety Office

Please visit our website at:

US Army Europe Safety Office